4.1.1 Homework

4-5. For each equation in parts (a) through (d) below, find the input value that gives the *smallest* possible output. In other words, find the *x*-value of the *lowest* point on the graph. Then find the input value that gives the *largest* possible output (or the *x*-value of the *highest* point on the graph). Hints⇔Help

a. $y = (x - 2)^2$
b. $y = x^2 + 2$
c. $y = (x + 3)^2$
d. $y = -x^2 + 5$
e. Where on the graphs of each of the above equations would you find the points with the smallest or largest *y*-values?

4-6. Sketch $y = x^2$, $y = -3x^2$, and $y = -0.25x^2$ on the same set of axes. What does a negative coefficient do to the graph? Hints⇔Help

4-7. Your results from this problem will be useful in the parabola **investigation** that you will do in Lesson 4.1.2. Hints⇔Help

a. Draw the graph of $y = (x - 3)^2$. If you are drawing the graph by hand be sure to use the domain $0 \le x \le 6$.
b. How is this graph different from the graph of $y = x^2$?

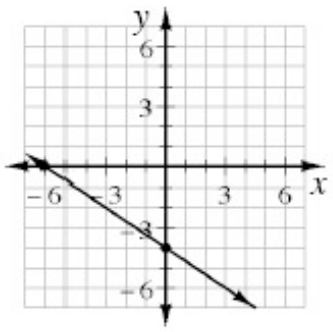
4-8. Consider the sequence with the initial value 256, followed by 64, 16, … Hints⇔Help

a. Write the next three terms of this sequence, then find a rule for the sequence.
b. If you were to keep writing out more and more terms of the sequence, what would happen to the terms?
c. Sketch a graph of the sequence. What happens to the points as you go farther to the right?

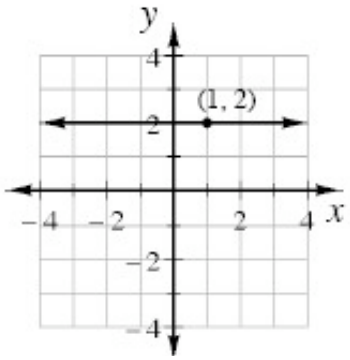
4-9. If $\frac{2}{3}$ of A is $\frac{5}{12}$, and $\frac{4}{3}$ of B is $\frac{8}{9}$, which is larger, A or B? Hints⇔Help

4-10. Write the equation for each graph. Hints⇔Help

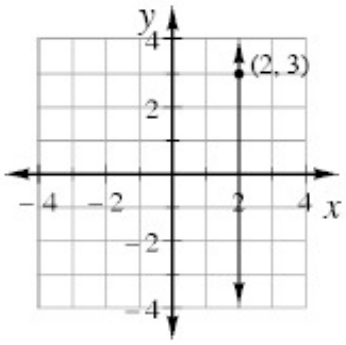
a.



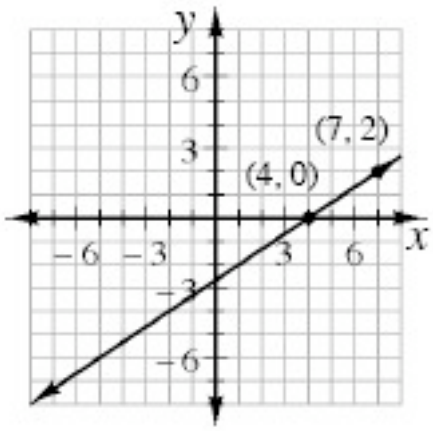
b.



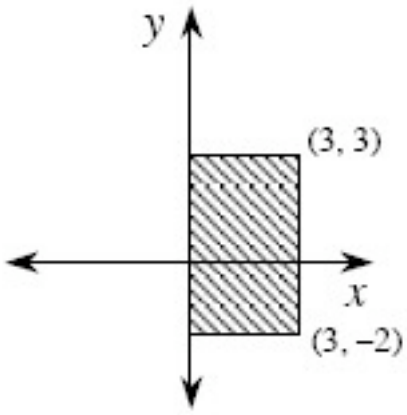
c.



d.



4-11. Examine the diagram below. Imagine spinning the rectangle around the *y*-axis. Think of a rectangular flap attached to the *y*-axis so that the rectangle will revolve around the *y*-axis. Hints⇔Help



a. Draw the resulting shape.
b. Find the volume of this shape.

4-12. What is a line of symmetry? Hints⇔Help

c. Draw a figure that has a line of symmetry.
d. Draw a figure that has *two* lines of symmetry.
e. Can you find a basic geometric shape that has an infinite number of lines of symmetry?

4.1.2 Homework

4-18. Explain what the differences are between an *accurate sketch* and a *careful graph*. Hints⇔Help

4-19. If $p(x) = x^2 + 5x - 6$, find: Hints⇔Help

a. Where $p(x)$ intersects the y-axis.
b. Where $p(x)$ intersects the x-axis.
c. If $q(x) = x^2 + 5x$.
    1. Find the intercepts of $q(x)$ and compare the graphs of $p(x)$ and $q(x)$.
    2. Find $p(x) - q(x)$.

4-20. Find the point where $y = 3x - 1$ intersects $2y + 5x = 53$. Hints⇔Help

4-21. Solve for z in each equation below. Hints⇔Help

a. $4^z = 8$
b. $4^{2z/3} = 8^{(z+2)}$
c. $3^z = 81^2$
d. $5^{(z+1)/3} = 25^{1/z}$

4-22. Simplify each of the following expressions. Be sure that your answer has no negative or fractional exponents. Hints⇔Help

a. $\left(\frac{1}{81}\right)^{-1/4}$
b. $x^{-2}\,y^{-4}$
c. $(2x)^{-2}(16x^2y)^{1/2}$

4-23. Daniela, Kieu, and Duyen decide to go to the movies one hot summer afternoon. The theater is having a summer special: Three Go Free (if they each buy a large popcorn and a large soft drink). They take the deal and end up spending $22.50. The next week, they go back again, only this time, they each pay $8.00 to get in, they each get a large soft drink, and they share one large bucket of popcorn. This return trip costs them a total of $37.50. Hints⇔Help

a. Find the price of a large soft drink and the price of a large bucket of popcorn.
b. Did you write two equations or did you use another method? If you used another method, write two equations now and solve them. If you already used a system of equations, skip this part.

4-24. The season free throw percentage for the Pi State Trigonometers basketball team was the following: 68, 69, 75, 80, 82, 85, 55, 67, 70, 70, 84, 83. Find the percentages above the third quartile. If you need help with quartiles, refer to problem 3-128. Hints⇔Help

4-25. Lettie just got her driver's license. Her friends soon nicknamed her "Leadfoot" because she is always going 80 mph on the freeway even though the speed limit is 65 mph. Hints⇔Help

a. At this speed, how long will it take her to travel 50 miles?
b. How long would it take her if she drove the 50 miles at 65 mph?
c. Speeding tickets carry fines of about $200 and usually increase the cost of insurance. If Lettie gets a ticket on this trip, then what would be her cost per minute of time saved?

4-26. Your friend is taking an algebra class at a different school where she is not allowed to use a graphing calculator. Explain to her how she can get a good sketch of the graph of the function $y = 2(x + 3)^2 - 8$ without using a calculator *and* without having to make an $x \rightarrow y$ table. Hints⇔Help

a. Be sure to explain how to locate the vertex, whether the parabola should open up or down, and how its shape is related to the shape of the graph of $y = x^2$.
b. Your friend also needs to know the x- and y-intercepts. Show her how to find them without having to draw an accurate graph or use a graphing calculator.

4-27. Consider the equations $y = 3(x - 1)^2 - 5$ and $y = 3x^2 - 6x - 2$. Hints⇔Help

a. Verify that they are equivalent by creating a table or graph for each equation.
b. Show algebraically that these two equations are equivalent by starting with one form and showing how to get the other.
c. Notice that the value for a is 3 in both forms of the equation, but that the numbers for b and c are different from the numbers for h and k. Why do you think the value for a would be the same number in both forms of the equation?

4-28. Use what you learned in the parabola investigation to write an equation for each of the parabolas described below. Hints⇔Help

a. A parabola just like $y = x^2$ but shifted 8 units right and 5 units down.
b. A parabola with a stretch factor of 10, sitting with its vertex on the x-axis at (−6, 0).
c. A downward-opening parabola with vertex (−7, −2) and a vertical compression of 0.6.

4-29. This is a Checkpoint for writing the equation of a line given two points. Hints⇔Help

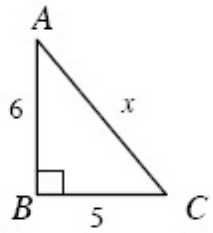
Write the linear equation for each line described in parts (a) and (b) below.

a. The line that goes through the points (−1, 4) and (2, 1).
b. The line that goes through the points (−8, 18) and (4, 9).
c. The line that passes through the points (−1, −2) and (11, 2).
d. Check your answers by referring to the Checkpoint 6 materials located at the back of your book.

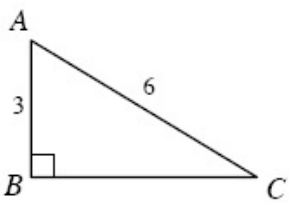
If you needed help to solve these problems correctly, then you need more practice writing the equation of a line through two given points. Review the Checkpoint 6 materials and try the practice problems. Also, consider getting help outside of class time. From this point on, you will be expected to find equations of lines such as these quickly and easily.

4-30. Solve for the indicated value. Leave your answer in exact form. Hints⇔Help

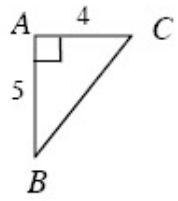
a. x = ____



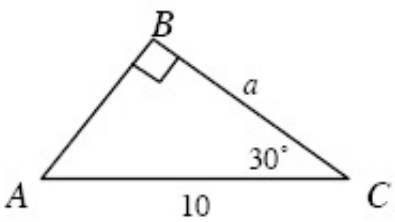
b. $m\angle C$ = ____



c. $m\angle B =$ ____



d. $a =$ ____



4-31. Simplify each expression without using a calculator. Remember that to simplify expressions with radicals, you can remove perfect square factors. Part (a) below is provided as an example. Hints⇔Help

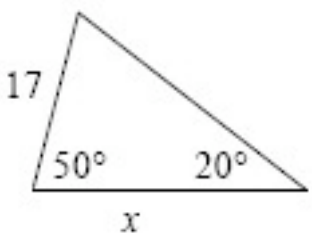
a. $\sqrt{18} = \sqrt{9 \cdot 2} = \sqrt{9} \cdot \sqrt{2} = 3\sqrt{2}$

b. $\sqrt{50}$

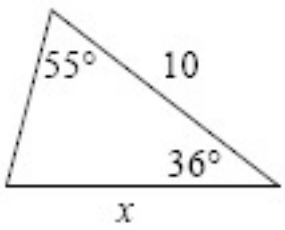
c. $\sqrt{72}$

d. $\sqrt{45}$

4-32. Find the value of x. Hints⇔Help



a.



b.

4-33. Suppose your parents spend an average of $300 each month for your food. Hints⇔Help

a. In five years, when you are living on your own, how much will you be spending on food each month if you are eating about the same amount and inflation averages about 4% per year?
b. Write an equation that represents your monthly food bill *x* years from now if both the rate of inflation and your eating habits stay the same.

4.1.3 Homework

4-39. Solve each of the following equations *without using the Quadratic Formula.* Hints⇔Help

a. $y^2 - 6y = 0$
b. $n^2 + 5n + 7 = 7$
c. $2t^2 - 14t + 3 = 3$
d. $\frac{1}{3}x^2 + 3x - 4 = -4$
e. Zero is one of the solutions of each of the above equations. What do all of the above equations have in common that causes them to have zero as a solution?

4-40. Find the vertex of each of the following parabolas by averaging the *x*-intercepts. Then write each equation in graphing form. Hints⇔Help

a. $y = (x - 3)(x - 11)$
b. $y = (x + 2)(x - 6)$
c. $y = x^2 - 14x + 40$
d. $y = (x - 2)^2 - 1$

4-41. Did you need to average the *x*-intercepts to find the vertex in part (d) of the preceding problem? Hints⇔Help

a. What are the coordinates of the vertex for part (d)?
b. How do these coordinates relate to the equation?

4-42. Scientists can estimate the increase in carbon dioxide in the atmosphere by measuring increases in carbon emissions. In 1998 the annual carbon emission was about eight gigatons (a gigaton is a billion metric tons). Over the last several years, annual carbon emission has been increasing by about one percent. Hints⇔Help

a. At this rate, how much carbon will be emitted in 2010?
b. Write a function, *C(x),* to represent the amount of carbon emitted in any year starting with the year 2000.

4-43. Make predictions about how many places the graph of each equation below will touch the *x*-axis. You may first want to rewrite some of the equations in a more useful form. Hints⇔Help

a. $y = (x - 2)(x - 3)$
b. $y = (x + 1)^2$
c. $y = x^2 + 6x + 9$
d. $y = x^2 + 7x + 10$
e. $y = x^2 + 6x + 8$
f. $y = -x^2 - 4x - 4$
g. Check your predictions with your calculator.
h. Write a clear explanation describing how you can tell whether the equation of a parabola will touch the *x*-axis at only one point.

4-44. Simplify each of the following expressions. Be sure that your answer has no negative or fractional exponents. Hints⇔Help

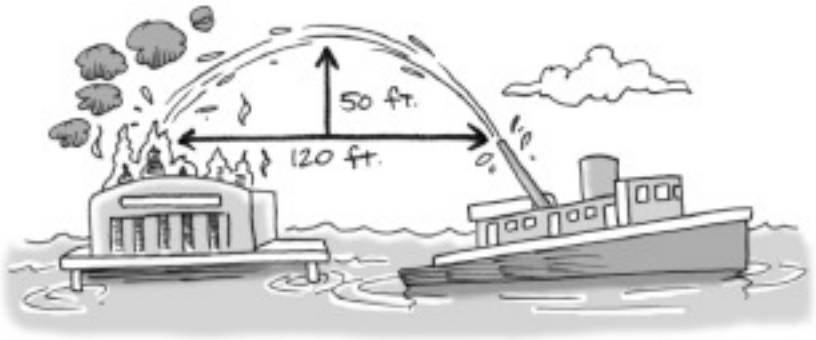
a. $64^{1/3}$
b. $(4x^2 y^5)^{-2}$
c. $(2x^2 \cdot y^{-3})(3x^{-1}y^5)$

4-45. Suppose you have a 3 by 3 by 3 cube. It is painted on all six faces and then cut apart into 27 pieces, each a 1 by 1 by 1 cube. If one of the cubes is chosen at random, what is the probability that: Hints⇔Help

a. Three sides are painted?
b. Two sides are painted?
c. One side is painted?
d. No sides are painted?

4.1.4 Homework

· **4-51.** FIRE! CALL 9-1-1!
A fireboat in the harbor is helping put out a fire in a warehouse along the pier. The distance from the barrel of the water cannon to the roof of the warehouse is 120 feet, and the water shoots up 50 feet above the barrel of the water cannon.



Sketch a graph and find the equation of the parabola that models the path of the water from the fireboat to the fire. Give the domain and range for which the function makes sense in relation to the fireboat. Hints⇔Help

· **4-52.** Draw accurate graphs of $y = 2x + 5$, $y = 2x^2$ + 5, and $y = \frac{1}{2}x^2 + 5$ on the same set of axes. Label the intercepts. Hints⇔Help

a. In the equation $y = 2x + 5$, what does the 2 tell you about the graph?
b. Is the 2 in $y = 2x^2 + 5$ also the slope? Explain.

· **4-53.** Do the sides of a parabola ever curve back in like the figure below? Explain your reasoning. Hints⇔Help

· **4-54.** Do the sides of the parabola approach straight vertical lines as shown in the figure below? (In other words, do parabolas have asymptotes?) Give a reason for your answer. Hints⇔Help

· **4-55.** Find the x- and y-intercepts of the graphs of the two equations below. Hints⇔Help

a. $y = 2x^2 + 3x - 5$

$$y = \sqrt{2x - 4}$$

b.

· **4-56.** The vertex of a parabola (point (*h*, *k*)) locates its position on the axes. The vertex serves as a **Locator Point** for a parabola. The other shapes you will be **investigating** in this course also have locator points. These points have different names but the same purpose for each different type of graph.

Sketch graphs for each of the following equations. On each sketch, label the locator point. Hints⇔Help

a. $y = 3x^2 + 5$
b. $f(x) = -(x - 3)^2 - 7$

· **4-57.** If $g(x) = x^2 - 5$, find: Hints⇔Help

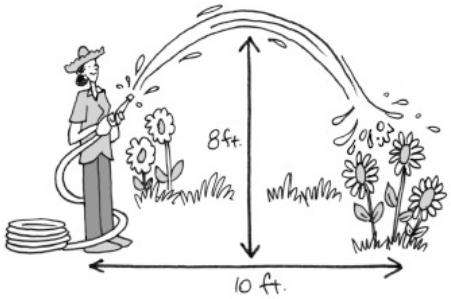
a. $g(\frac{1}{2})$
b. $g(h + 1)$

· **4-58.** If $g(x) = x^2 - 5$, find the value(s) of x so that: Hints⇔Help

a. $g(x) = 20$
b. $g(x) = 6$

4.2.1 Homework

- **4-64.** While watering her outdoor plants, Maura noticed that the water coming out of her garden hose followed a parabolic path. Thinking that she might be able to model the path of the water with an equation, she quickly took some measurements. The highest point the water reached was 8 feet, and it landed on the plants 10 feet from where she was standing. Both the nozzle of the hose and the top of the flowers were 4 feet above the ground. Help Maura write an equation that describes the path of the water from the hose to the top of her plants. What domain and range make sense for the model? Hints⇔Help



- **4-65.** Draw the graph of $y = 2x^2 + 3x + 1$. Hints⇔Help
  a. Find the x- and y-intercepts.
  b. Where is the line of symmetry of this parabola? Write its equation.
  c. Find the coordinates of the vertex.
- **4-66.** Change the equation in the previous problem so that the parabola has only one x-intercept. Hints⇔Help
- **4-67.** Simplify each expression. Remember you can simplify radicals by removing perfect square factors (e.g. $\sqrt{12} = \sqrt{4 \cdot 3} = 2\sqrt{3}$). Hints⇔Help
  a. $\sqrt{24}$
  b. $\sqrt{18}$
  c. $\sqrt{3} + \sqrt{3}$
  d. $\sqrt{27} + \sqrt{12}$
- **4-68.** Rewrite each of the following expressions so that your answer has no negative or fractional exponents. Hints⇔Help
  a. $16^{5/4}$
  b. $(x^5y^4)^{1/2}$
  c. $(x^2y^{-1})(x^{-3}y)^0$
- **4-69.** Harvey's Expresso Express, a drive-through coffee stop, is famous for its great house coffee, a blend of Colombian and Mocha Java beans. Their archrival, Jojo's Java, sent a spy to steal their ratio for blending beans. The spy returned with a torn part of an old receipt that showed only the total number of pounds and the total cost, 18 pounds for $92.07. At first Jojo was angry, but then he realized that he knew the price per pound of each kind of coffee ($4.89 for Colombian and $5.43 for Mocha Java). Show how he could use equations to figure out how many pounds of each type of beans Harvey's used. Hints⇔Help

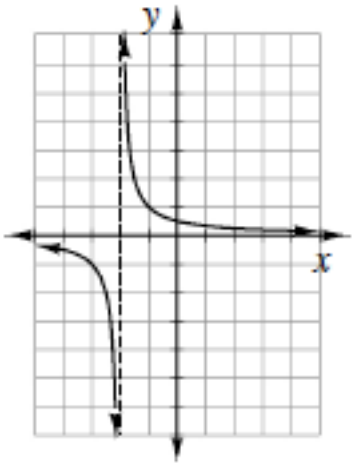
- **4-70.** Lilia wants to have a circular pool put in her backyard. She wants the rest of the yard to be paved with concrete. Hints⇔Help
    a. If her yard is a 50 ft. by 30 ft. rectangle, what is the largest radius pool that can fit in her yard?
    b. If the concrete is to be 8 inches thick, and costs $2.39 per cubic foot, what is the cost of putting in the concrete? No concrete will be used in the pool. (Reminder: Volume = (Base Area · Depth).
- **4-71.** Write the equation $y = x^2 + 7x - 8$ in graphing form. Use what you learned about finding the vertex in Lesson 4.1.3 to help you. Hints⇔Help
- **4-72.** Consider a line with a slope of 3 and a y-intercept at (0, 2). Hints⇔Help
    a. Sketch the graph of this line.
    b. Write the equation of the line.
    c. Find the initial term and the next three terms of the sequence $t(n) = 3n - 1$. Plot the terms on a new set of axes next to your graph from part (a) above.
    d. Explain the similarities and differences between the graphs and equations in parts (a) through (c). Are both continuous?
- **4-73.** The gross national product (GNP) was $1.665 \cdot 10^{12}$ dollars in 1960 and it increased at the rate of 3.17% per year until 1989. Use this information to answer each of the questions below. (The number $1.665 \cdot 10^{12}$ is expressed in scientific notation. Written in standard notation, the number is 1,665,000,000,000.) Hints⇔Help
    a. What was the GNP in 1989?
    b. Write an equation to represent the GNP t years after 1960, assuming that the rate of growth remained constant.
    c. Do you think the rate of growth really remains constant? Explain.
- **4-74.** Write each expression in simpler radical form. Hints⇔Help
    a. $\sqrt{x} + \sqrt{y} + 5\sqrt{x} + 2\sqrt{y}$
    b. $(2\sqrt{8})^2$
    c. $\dfrac{\sqrt{50}}{\sqrt{2}}$
    d. $\sqrt{\dfrac{3}{4}}$
- **4-75.** Multiply each of the following expressions. Hints⇔Help
    a. $2x^2(3x + 4x^2y)$
    b. $(x^3y^2)^4(x^2y)$
- **4-76.** Sketch a graph and draw the line of symmetry for the equation $y = 2(x - 4)^2 - 3$. What is the equation of the line of symmetry? Hints⇔Help
- **4-77.** People who live in isolated or rural areas often have their own tanks that hold gas to run appliances like stoves, washers, and water heaters. Some of these tanks are made in the shape of a cylinder with two hemispheres on the ends, as shown in the picture at right. (A hemisphere is half of a sphere, and the volume of a sphere is found by using $V = 4/3\pi r^3$.)

    The Inland Propane Gas Tank Company wants to make tanks with this shape, but offer different models in different sizes. The cylindrical portion of each of the tanks will be 4 meters long. However, the radius r will vary among the different models. Hints⇔Help

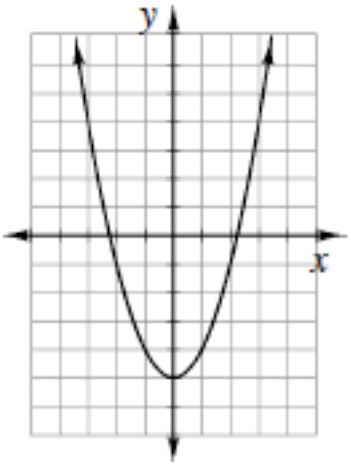
    a. One of their tanks has a radius of 1 meter. What is its volume?
    b. When the radius doubles (to 2 meters), will the volume double? Explain. Then figure out the volume of the larger tank with $r = 2$ m.
    c. Write an equation that will let Inland Propane Gas Tank Company determine the volume of a tank with any size radius.

- **4-78.** Write a possible equation for each of these graphs. Assume that one mark on each axis is one unit. When you are in class, check your equations on a graphing calculator and compare your results with your teammates. Hints⇔Help

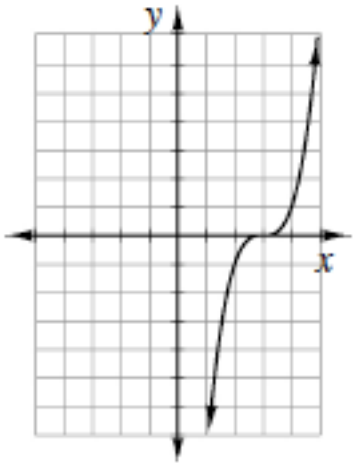
a.



b.



c.



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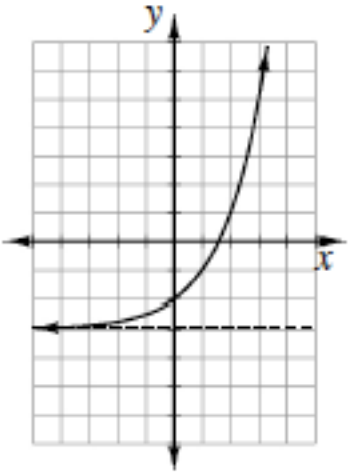

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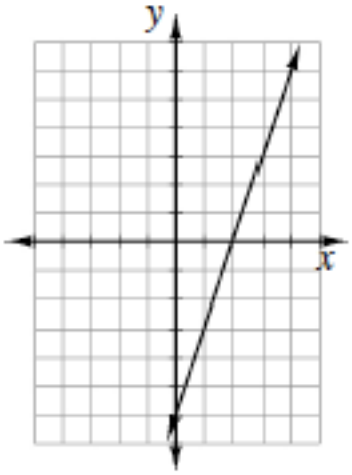

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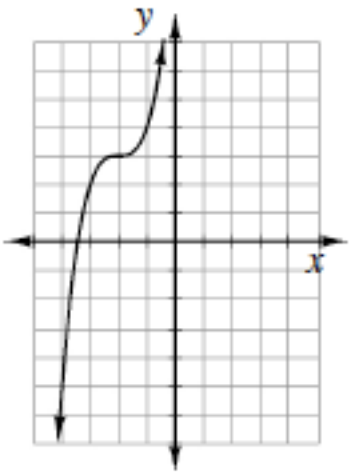

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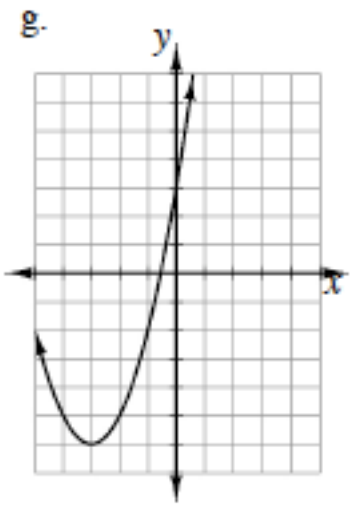
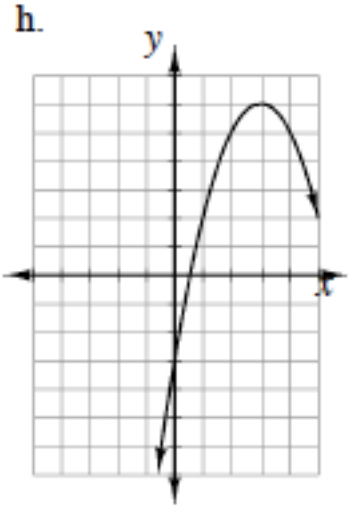
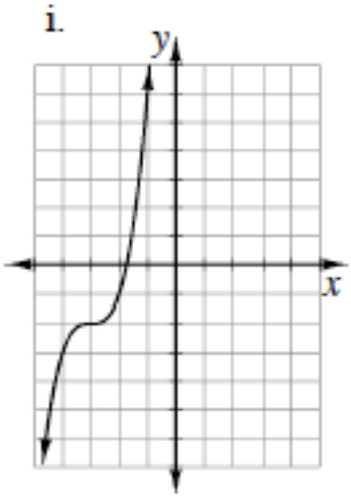


h.



i.



- **4-79.** By mistake, Jim graphed $y = x^3 - 4x$ instead of $y = x^3 - 4x + 6$. What should he do to his graph to get the correct one? Hints⇔Help
- **4-80.** This is a Checkpoint for solving quadratic equations and for finding the *x*- and *y*-intercepts of the graph of a quadratic function. Hints⇔Help

a. Find the *x*- and *y*-intercepts for the graph of $y = x^2 + 4x - 17$ without using a graphing calculator.

b. Check your answers by referring to the Checkpoint 7 materials located at the back of your book.

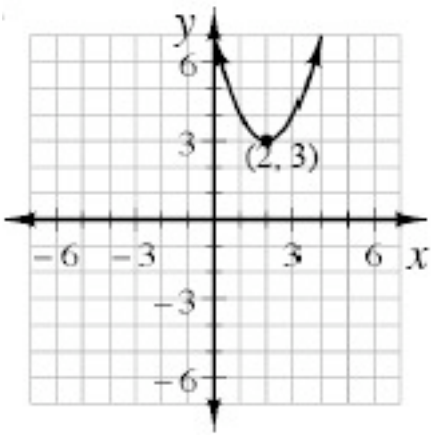
If you needed help to solve this problem correctly, then you need more practice in solving quadratic equations and finding the intercepts of a quadratic function. Review the Checkpoint 7 materials and try the practice problems. Also, consider getting help outside of class time. From this point on, you will be expected to find intercepts of quadratic functions easily and accurately.

- **4-81.** Simplify each radical expression. Hints⇔Help
  a. $(3\sqrt{2})^2$
  b. $\sqrt{\frac{9}{4}}$
  c. $\sqrt{\frac{1}{3}}$
  d. $(3+\sqrt{2})^2$
- **4-82.** Factor each of the following expressions. Look for the difference of squares and common factors. Hints⇔Help
  a. $4x^2 - 9y^2$
  b. $8x^3 - 2x^7$
  c. $x^4 - 81y^4$
  d. $8x^3 + 2x^7$
  e. Did you use a shortcut to factor the expressions in parts (a) through (c)? If so, describe it. If not, what pattern do you see in these expressions? How can you use that pattern to factor quickly?
- **4-83.** Solve for *x*: $ax + by^3 = c + 7$. Hints⇔Help
- **4-84.** The slope of $\overline{AB}$ is 5, with points $A(-3, -1)$ and $B(2, n)$. Find the value of *n* and the distance between points *A* and *B*. Hints⇔Help
- **4-85.** Given $f(x) = x^3 + 1$ and $g(x) = (x + 1)^2$: Hints⇔Help
  a. Sketch the graphs of the two functions.
  b. Solve $f(x) = 9$.
  c. Solve $g(x) = 0$.
  d. Solve $f(x) = -12$.
  e. Solve $g(x) = -12$.
  f. For how many values of *x* does $f(x)$ equal $g(x)$? Explain.
  g. Find and simplify an expression for $f(x) - g(x)$.

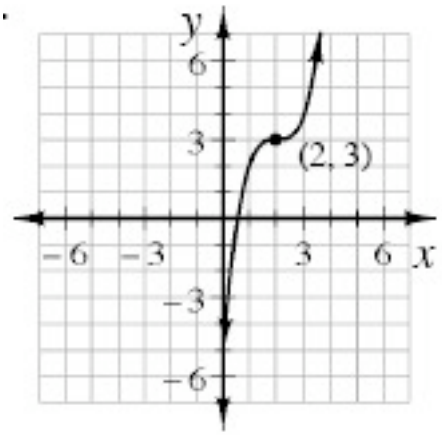
4.2.2 Homework

- **4-91.** Use the point (h, k) to help you write a possible equation for each graph shown below. Hints⇔Help

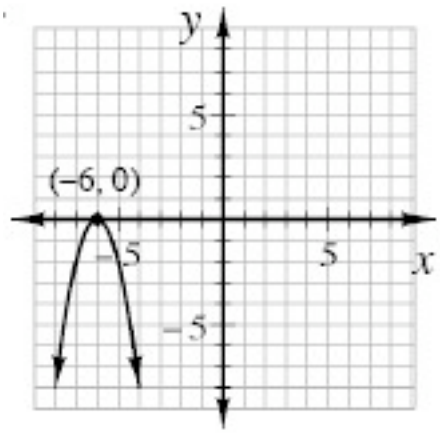
a.



b.



c.



- **4-92.** Find the domain and range for each of the graphs in the previous problem. Hints⇔Help
- **4-93.** For each of the following equations, describe how d transforms the parent graph. Hints⇔Help
  a. $y = dx^3$
  b. $y = 3x^2 - d$
  c. $y = (x - d)^2 + 7$
  d. $y = \frac{1}{x} + d$

- **4-94.** Plot each pair of points and find the distance between them. Give answers in both square-root form and as decimal approximations. Hints⇔Help
    a. (3, −6) and (−2, 5)
    b. (5, −8) and (−3, 1)
    c. (0, 5) and (5, 0)
    d. Write the distance you found in part (c) in simplified square-root form.
- **4-95.** Rewrite each of the following expressions so that your answers have no negative or fractional exponents. Hints⇔Help
    a. $5^{-2}4^{1/2}$
    b. $\dfrac{3xy^2z^{-2}}{(xy)^{-1}z^2}$
    c. $(3m^2)^3(2mn)^{-1}(8n^3)^{2/3}$
    d. $(5x^2y^3z)^{1/3}$
- **4-96.** Solve each equation for x (that is, put it in $x =$ ____ form). Hints⇔Help
    a. $y = 2(x - 17)^2$
    b. $y + 7 = \sqrt[3]{x+5}$
- **4-97.** Where do the following pairs of lines intersect? Hints⇔Help
    a. $y = 5x - 2$
    $y = 3x + 18$
    b. $y = x - 4$
    $2x + 3y = 17$
- **4-98.** Graph these two lines on the same set of axes: $y = 2x$ and $y = -\frac{1}{2}x + 6$. Hints⇔Help
    a. Find the x- and y-intercepts for each equation.
    b. Shade the region bounded by the two lines and the x-axis.
    c. What are the domain and range of the region? How did you find these values?
    d. Find the area of this region. Round your answer to the nearest tenth.

4.2.3 Homework

· **4-103.** Another way to look at absolute value is to think of the absolute value of a number as its distance from zero on a number line. For example, $|6| = 6$ and $|-6| = 6$ because both 6 and "6 are exactly 6 units from zero on the number line. You can, therefore, think of the equation such as $|x| = 5$ as the question, *"What numbers are exactly five units from zero on the number line?"* Thus, the solutions are 5 and −5. Draw a number line to show the solutions to the following equations. Hints⇔Help

a. $|x| = 3$
b. $|x| = 0$
c. $|x| + 2 = 6$
d. $3|x| = 15$
e. $|x - 5| = 2$
f. $|x + 3| = 7$

· **4-104.** Compare the two expressions $|11 - 5|$ and $|5 - 11|$. Hints⇔Help

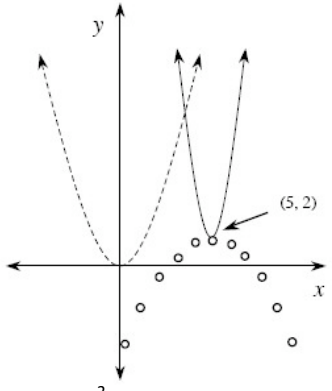
a. How would you simplify each of them?
b. Explain why you get the same answer.

· **4-105.** Think of absolute value as a statement about distance as you answer the questions below. What values of x in parts (a) through (d) make each equation true? Hints⇔Help

a. $|x - 7| = 50$
b. $|x + 7| = 50$
c. $|10 - x| = 12$
d. $|2x + 1| = -3$
e. What mathematical operation is best used for finding the distance between two numbers? In other words, if you wanted to know the distance from 42 to 117, what arithmetic expression would represent that distance?
f. Suppose you wanted to write an equation to represent the statement, "The distance between a number and 47 is 21." You would not know whether to write $x - 47 = 21$ or $47 - x = 21$. Absolute value equations can allow you to write a correct expression without knowing which value is larger. Write two absolute value equations that mean "the distance between a number and 47 is 21."
g. Write and solve an absolute value equation that says each of the following:
    1. *"The distance between x and 4 is 12."*
    2. *"The distance between x and −9 is 15."*

· **4-106.** What difference is there between $f(x) = |x|$ and $y = |x|$, in relation to their graphs or tables? What conclusions can you draw from your answer? Hints⇔Help

· **4-107.** The graph of $y = x^2$ is shown as a dashed curve below. Estimate the equations of the two other parabolas. Hints⇔Help



· **4-108.** Find the x- and y-intercepts and the vertex of $y = x^2 + 2x - 80$, sketch the graph, and write the equation in graphing form. Hints⇔Help

· **4-109.** You are standing outside the school, waiting to cross the street, when you hear a booming car stereo approaching. Hints⇔Help

a. Sketch a graph that shows the relationship between how far away from you the car is and the loudness of the music.
b. Which is the dependent variable and which is the independent variable?

· **4-110.** Write each expression below in simplest radical form. Hints⇔Help

a. $\sqrt{75}+\sqrt{27}$
b. $\sqrt{x}+2\sqrt{x}$
c. $(\sqrt{12})^2$
d. $(3\sqrt{12})^2$

· **4-111.** Is −578 a term in the sequence defined by $t(n) = -5n + 7$? **Justify** your answer.

4.2.4 Homework

· **4-119.** A parabola has vertex (2, 3) and contains the point (0, 0). Hints⇔Help

a. If this parabola is a function, find its equation.
b. Suppose this parabola is not a function, but is a "sleeping" parabola. Find its equation.

· **4-120.** The quadratic formula can be used to help solve $4x^3 + 23x^2 - 2x = 0$. Show or explain how. Hints⇔Help

· **4-121.** For each equation below, find the x- and y-intercepts and the locator point (h, k), then write the equations in graphing form. Hints⇔Help

a. $y = 7 + 2x^2 + 4x - 5$
b. $x^2 = 2x + x(2x - 4) + y$

· **4-122.** This is a Checkpoint for finding the slope of a line that passes through two points and for finding the distance between the points. Hints⇔Help

Find the slope of a line that passes through each of the pairs of points given below and then find the distance between the two points.

a. (0, 0) and (4, 4)
b. (−2, 4) and (4, 7)
c. (12, 18) and (−16, −19)
d. (0, 0) and (25, 25)
e. Check your answers by referring to the Checkpoint 8 materials located at the back of your book.

If you needed help to find the slope or distance correctly, then you need more practice. Review the Checkpoint 8 materials and try the practice problems. Also, consider getting help outside of class time. From this point on, you will be expected to find slope and distance given two points easily and accurately.

· **4-123.** Consider the system of equations below: Hints⇔Help

$$3y - 4x = -1$$
$$9y + 2x = 4$$

a. What is the parent of each equation?
b. Solve this system algebraically.
c. Find where the two graphs intersect.
d. Explain the relationship between parts (b) and (c) above.

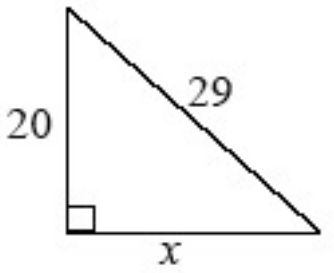
· **4-124.** Find the intercepts, the locator point (h, k), the domain, and the range for each of the following functions. Hints⇔Help

a. $y = |x - 4| - 2$
b. $y = -|x + 1| + 3$

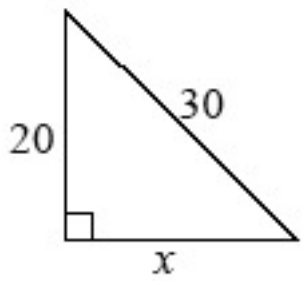
· **4-125.** A line passes through the points (0, 2) and (1, 0). Hints⇔Help

a. Find the slope of the line.
b. Find the slope of a line parallel to the given line.
c. Find the slope of a line perpendicular to the given line.
d. Find the product of the slopes.
e. Make a conjecture about the product of the slopes of any two perpendicular lines.
f. Test your conjecture by creating more examples.

· **4-126.** Find the value of *x*. Hints⇔Help



a.



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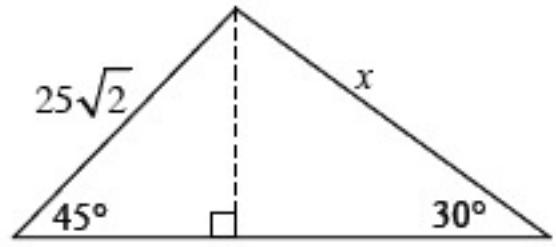
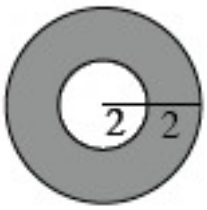
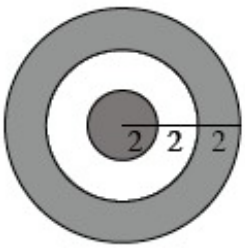


c.

· **4-127.** A dart hits each of these dart boards at random. What is the probability that the dart will not land in the shaded area? Hints⇔Help



a.



b.

4.3.1 Homework

· **4-135.** For each quadratic function below, use the idea of completing the square to write it in graphing form. Then state the vertex of each parabola. Hints⇔Help

a. $f(x) = x^2 + 6x + 15$
b. $y = x^2 - 4x + 9$
c. $f(x) = x^2 + 8x$
d. $y = x^2 + 5x - 2$

· **4-136.** Represent the number of small squares you would have to add to an expression of the form $x^2 + bx$ to make a complete square. Use drawings and examples if they help to clarify. Hints⇔Help

· **4-137.** Consider the equation $(x - 2)^2 + (y + 7)^2 = 81$. Hints⇔Help

a. What is the shape of the graph? How can you tell?
b. What other information can you get about the graph by looking at the equation?
c. Graph the equation without a table. Is the relation a function? Why or why not?

· **4-138.** Explain the difference between the graphs of $y = \frac{1}{x}$ and $y = 4(\frac{1}{x+5}) + 7$. Hints⇔Help

· **4-139.** How is $y = 2^x$ different from $y = -(2^x)$? Sketch the graph of $y = -(2^x)$. Hints⇔Help

· **4-140.** Sketch the graph of $y = 2(x - 1)^2 + 4$. Hints⇔Help

a. Now rewrite the equation $y = 2(x - 1)^2 + 4$ without parentheses. Remember the order of operations!
b. What would the difference be between the graphs of the two equations above? This is sort of a trick question, but explain your reasoning.
c. What is the parent of $y = 2(x - 1)^2 + 4$?
d. What is the parent of $y = 2x^2 - 4x + 6$?

· **4-141.** Find the coordinates of the intercepts for each of the following functions: Hints⇔Help

a. $g(x) = (x + 3)^3$
b. $y - 1 = 3^x$

· **4-142.** If $h(x) = (x + 2)^{-1}$, find: Hints⇔Help

a. $h(3)$
b. $h(-3)$
c. $h(a - 2)$

· **4-143.** The point (3, −7) is on a line with a slope of $\frac{2}{3}$. Find another point on the line. Hints⇔Help

4.3.2 Homework

· **4-148.** Jessica's new dilemma is the following problem: Hints⇔Help

· Use the idea of completing the square to write the following quadratic function in graphing form:

· $y = x^2 - 6x - 2$.

· As usual, Anita was looking over Jessica's shoulder as she read the problem. *"You can't do that one with the tiles,"* she announced.

· *"Why not?"* asked Jessica.

· *"Because it has negatives in it, and our teacher said the tiles are only a good model for positive numbers, but not negatives,"* Anita assured her.

· *"Who needs the tiles?"* said Jessica. *"I can use the* idea *of completing the square algebraically. See, the complete square for* $x^2 - 6x$ *is* $(x - 3)^2 = x^2 - 6x + 9$ *. So I just have to subtract 11 to get that expression to equal* $x^2 - 6x - 2$*."*

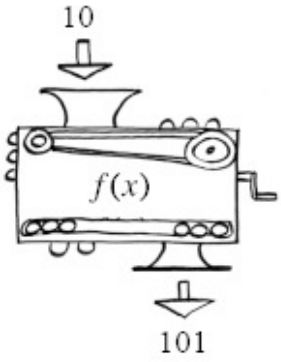
a. Based on Jessica's method above, what is the graphing form of this equation? State the vertex and sketch the graph.
b. Use the idea of completing the square to write the function $f(x) = x^2 - 4x - 5$ in graphing form. State the vertex and sketch the graph.

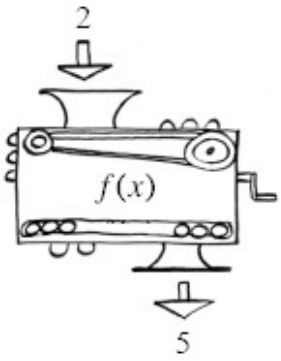
· **4-149.** Use the technique of completing the square to express $y = x^2 - 5x + 7$ in graphing form and state the vertex. Hints⇔Help

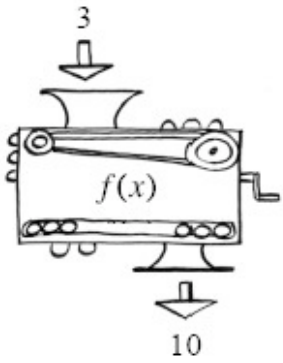
· **4-150.** The amount of profit (in millions) made by Scandal Math, a company that writes math problems based on tabloid articles, can be found by the equation $P(n) = -n^2 + 10n$, where n is the number of textbooks sold (also in millions). Find the maximum profit and the number of textbooks that Scandal Math must sell to attain this maximum profit. Hints⇔Help

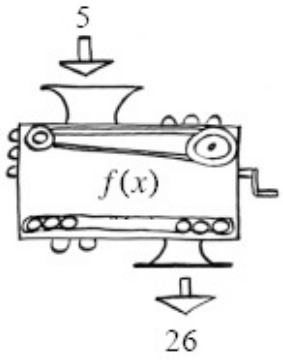
· **4-151.** Shortcut Shuneel claims he has a short cut for finding the vertex of a parabola. While using his short cut on $y = 2x^2 + 3x + 1$, he ended up with $y = 2(x + \frac{3}{4})^2 - \frac{7}{2}$. Is Shuneel correct? Why or why not? Hints⇔Help

· **4-152.** Remember function machines? Each of the following pictures shows how the same machine changes the given x-value into a corresponding $f(x)$ value. Find the rule for this machine. Hints⇔Help









· **4-153.** If $x^2 + kx + 18$ is factorable, what are the possible values of k? Hints⇔Help

· **4-154.** Give the equations of two functions, $f(x)$ and $g(x)$, so that $f(x)$ and $g(x)$ cross at exactly: Hints⇔Help

a. One point.
b. Two points.
c. No points.

· **4-155.** Multiply the expressions in parts (a) through (c) to remove the parentheses. Hints⇔Help

a. $(x - 1)(x + 1)$
b. $2x(x + 1)(x + 1)$
c. $(x - 1)(x + 1)(x - 2)$
d. Find the x- and y-intercepts of $y = x^3 - 2x^2 - x + 2$. The factors in part (c) should be useful.